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## Modern Developments in Steelmaking

INTERNATIONAL SYMPOSIUM AT NML

350 delegates from India and 80 from 20 other countries presented and discussed some 60 papers and 8 keynote addresses at 8 technical sessions encompassing various aspects of modern steelmaking at an international symposium on 'Modern Developments in Steelmaking'. The symposium was organized jointly by the National Metallurgical Laboratory (NML), the Indian Institute of Metals (IIM), the Ministry of Steel, Government of India, and the Tata Iron & Steel Company Limited (TISCO), from 16 to 22 February 1981 at NML, Jamshedpur.

The technical sessions covered: theoretical aspects of oxygen steelmaking; Design and project engineering; raw materials for steelmaking; refractories for steelmaking; operational aspects of pneumatic processes, and other processes; Ladle metallurgy; and Deoxidation and ingot casting.

Invited lectures by Shri S.K. Chavali (India) and Dr B.R. Nijhawan (Austria, Vienna) and the opening address by Shri S. Samaddar (Secretary, Department of Steel, Government of India) provided a proper backdrop to the status of the steel industry on the national and global scenes.

In the first technical session on 'Theoretical aspects of oxygen steelmaking', principles of steelmaking in open converters and in particular the top and bottom blowing processes as well as the relative merits and demerits of metallurgical reactions generated in the vessel, were highlighted. During

panel discussions, due note was made of the requirements of oxygen purity in pneumatic processes in the context of the current trend towards nitrogen bubbling from the bottom, with added advantage in oxygen steelmaking.

Panel discussions in the session on 'Design and project engineering' highlighted the layout and essential characteristics of various oxygen steelmaking processes including set-ups for injection metallurgy.

The session on 'Raw materials for steelmaking' laid emphasis on the quality of raw materials for efficient operation of basic oxygen converters. Discussed at the session were the deleterious effects of high silicon content in the hot metal, which is extremely common in India, and various approaches to overcome such effects. Panel discussions were concerned with the low lining life of L.D. converters at Rourkela and Bokaro Steel Plants, and most of the questions raised dealt with the impact of raw material quality on the lining life of L.D. vessels.

The status of various refractories used in steelmaking and the factors affecting the lining life of converters were covered in the sessions devoted to 'Refractories for steelmaking'. The main point that was brought out was that magnesite refractories could be preferred insofar as the lining life of the converter is concerned. However, because of the high cost of magnesite refractories, various shops used different grades of dolomite or magnesite, and in many cases, a combination of both. The lining

### IEM Renamed as IICB

The name of the Indian Institute of Experimental Medicine (IEM), Calcutta, has been changed to Indian Institute of Chemical Biology (IICB), Calcutta. □

life of imported magnesite bricks was found to be better than that of Indian dolomite blocks. The consensus was that the manufacture of high-grade magnesite bricks in India would necessitate import of rich grades of magnesite not normally available in India; else, a sea-water magnesia plant could be considered as the best alternative. A sea-water magnesia plant could be economical, it was felt, only if the plant is based on at least 1,20,000 tonnes/annum of magnesia for which at present there may not be sufficient demand in India.

The session on 'Operational aspects of pneumatic processes' revealed that while the combined blowing was an emerging technology in steelmaking, the choice today appeared to lie between bottom blowing and combined blowing processes, with the classical L.D. processes of steelmaking continuously losing ground. The OBM/O-BOP processes of bottom blowing were not considered promising for the future as was thought of earlier, since many of its

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advantages had been taken care of by various processes of combined blowing. Delegates agreed that while bottom blowing converters had been installed in recent years in some steel plants for making ultra-low-carbon steels, it was unlikely that many more would be installed in operating steel-works, for the existing L.D. vessel could be easily modified to one of the combined blowing processes. Opinion was, however, divided on new installations.

The last three technical sessions covered electric furnace steelmaking, ladle metallurgy, and deoxidation and ingot-making. The first of these revealed that electric arc furnaces would continue to play an increasing role in steelmaking and that its share had already increased from a meagre 2% to 20% in the last two decades. Developments had also taken place in direct reduction technology over the last few years and almost 25 million tonnes of direct-reduced iron are being produced in the world today. Direct reduction coupled with other developments in electric furnace technologies, such as plasma melting and ultra-high-power furnace, would strengthen the status of electric furnace in the steelmaking field.

The session on 'Ladle metallurgy in steelmaking' brought out that ladle metallurgy would play an important role in steelmaking and almost all steelmaking operations excepting decarburization are gradually being transferred from steelmaking furnaces to ladles.

Delivering one of the valedictory addresses, Dr B.R. Nijhawan (UNIDO, Vienna) cautioned the developing countries against rushing in for introduction of any development still in the laboratory stage of industrialized nations. He called upon the developing countries to adopt only those technologies which were best suited to the local conditions of manpower and raw materials. Highly sophisticated technologies developed in industrialized countries might not work at all places. He felt that many new innovations are

being tried in developing countries for the first time and this was not a healthy trend.

The symposium deliberations revealed that the advent of the twin hearth process, which could lead to a saving of as much as 30% fuel in open hearth furnaces, could be of particular interest to India. Since open hearth furnaces account for over 70% of India's steel production and these cannot be abandoned overnight, this latest Russian technology could be straight-away adopted in India. As far as oxygen steelmaking was concerned, its advantages were elucidated clearly and it became obvious that bath agitation and combined blowing could merit attention in the next couple of years.

For increasing production in mini steel plants and for achieving cost reduction in almost all areas of steelmaking, the ladle metallurgical processes attracted considerable attention. The main emphasis was on energy saving in steelmaking, and from this point of view, a number of electric furnace-based steel plants are being installed using the UHP technology or using high proportions of sponge iron. Secondary steelmaking processes like VOD, AOD, VAD, ASEA-SKF and injection techniques have not only enabled production of special quality steels but also raised productivity.

The symposium also brought into focus the present status and future trends in steel production in both the developing and developed countries. With the present growth rate witnessed by the developing world, which in itself is double the rate a decade ago—15% vs 7.5%—it was felt that the developing countries may touch a figure of 470 million tonnes by A.D. 2000 from the present level of 106 million tonnes (1980). A still higher growth rate was predicted for the developing countries up to A.D. 2000. But even then, it was felt that the developing countries would import 117 million tonnes by A.D. 2000. The recommendations of the Lima Conference of the UNIDO General Assembly were considered to be targets

for the developing countries to increase their steel production to reach a share of contribution to 25-30% of global output.

The symposium also drew attention to the need for developing and adapting low-energy intensive technologies to conserve energy in the steel sector, also the need to utilize the non-coal for conserving the limited resources of coking coal, besides recycling wastes, fines and other materials which are often dumped around the steel plants. The present tendency of some of the developed countries to establish steel plants in high-energy areas, as for example steel plants in Qatar by Japan, could be a distinct pointer to the need for utilizing the available energy.

### Clays and Clay-based Consultation Industries Meeting at RRL-Trivandrum

Various aspects of clays and clay-based products were presented and discussed at a consultation meet on 'Clays and Clay-based Industries' organized by Regional Research Laboratory (RRL), Trivandrum, on 3 March 1980. Following panel discussions, the meeting called for a determined effort to utilize the overburden material of coal mines and the setting up of a task force comprising the Kerala State Industries Development Corporation, the state Public Works Department, and Central laboratories for effectively utilizing research results, know-how, and expertise. To help entrepreneurs and industrialists, the meeting called for compilation of a clay map of Kerala showing resources, and containing information on evaluation of clays and their suitability for various end uses. The panel stressed the need for diversification and modernization of clay-based industries with particular reference to structural work, and the importance of small-sized tunnel kilns because of their economy. The panel also recommended the setting up of an institute of ceramics in Kerala to cater



the needs of ceramic technologists. The meeting also paid attention to the needs and requirements of village potters and other clay artisans.

Dr S. Kumar, Director, Central Glass and Ceramic Research Institute, Calcutta, inaugurated the meet. The RRL's Director Prof. P.K. Rohatgi stressed the importance of clay and clay-based industries, especially in Kerala, and highlighted the laboratory's ongoing R&D activities.

At a function held at the laboratory on the same day the Kerala chapter of the Indian Ceramic Society was inaugurated. □

### Smt Gandhi Visits RRL-Bhubaneswar

Smt Indira Gandhi, Prime Minister, and President of CSIR, visited the Regional Research Laboratory (RRL), Bhubaneswar, on 29 March 1981. Addressing the staff, the Prime Minister showed appreciation for the laboratory's work on the utilization of natural resources. Stating that the contributions of the laboratory in

harnessing these resources would fulfil the socio-economic needs of the state in particular and those of the country in general, she stressed the need for research on alternative sources of energy. □

### Biomass Production Centre of NBRI Inaugurated

The National Botanical Research Institute (NBRI), Lucknow, has set up, as part of the sixth plan, a Biomass Research and Training Centre at its Banthra Research Station. Sponsored by the Department of Science and Technology (DST), the project aims at producing biomass for fuel, alcohol, and hydrocarbons. Apart from assessing biomass production potential of fast-growing plant species of proven ability to marginal soils the centre will develop appropriate production technologies and undertake studies on economics of biomass plantations. The extension programme of the project is to be implemented in collaboration with the Uttar Pradesh Department of Social Forestry.

Prof. M.G.K. Menon, Secretary, DST and Chairman, Commission for Additional Sources of Energy, and also then the Director General, Scientific & Industrial Research, inaugurated the centre on 18 February 1981 by planting a few 'shisham' saplings. The centre would take up planting of 35,000 trees of 14 fast-growing species to be raised in collaboration with the Department of Social Forestry. Prof. Menon hoped that this project might find solutions to some of the pressing energy problems due to shortage of coal and petroleum products, felling of forest trees, and a general fuel scarcity.

Earlier, NBRI's Director Dr T.N. Khoshoo took Prof. Menon round an exhibition depicting the achievements of Banthra Research Station over the last 25 years, including a one-hectare man-made forest raised by using special management techniques to reduce alkalinity, which is now a complete ecosystem with rich flora and fauna.

The Biomass Production Centre has started functioning with the following objectives:

1. To assess biomass production potential of plant species of proven ability to soil alkalinity as also of other species which may qualify as promising candidates, and to identify and multiply the elite clones;
2. To identify and standardize agrotechniques including cropping patterns, rotation lengths, fertilizer responses, etc. to secure maximal biomass yield;
3. To undertake studies of nutrient cycling of selected species and nitrogen economy of selected legumes;
4. To assess the biomass of production potential of selected crop plants and conversion of their biomass to alcohol;
5. To determine the economics of short-rotation biomass plantations; and
6. To disseminate knowledge concerning management of firewood plantations in rural areas.

A time-targeted project, the centre is expected to achieve its short-term objectives in five years and long-term



Prof. P.K. Jena, Director, RRL, Bhubaneswar, explaining the R&D activities of the laboratory to the Prime Minister Smt Indira Gandhi and Orissa's Chief Minister Shri J.B. Patnaik



objectives in 5-10 years' time. A beginning in this direction has already been made by introducing six strains of cassava from the Central Tuber Crops Research Institute, Trivandrum, and 18 varieties of sugarbeet, which are undergoing adaptability trials, besides some fast-growing tree species. The feasibility of growing these crops on marginal lands has already been demonstrated and trial plantings are now being undertaken to assess their potential for production.

In the light of the fact that alkaline and saline soils occupy nearly seven million hectares of land in India, this project assumes great significance. □

## CSIO Develops Ultrasonic Hardness Tester

A portable ultrasonic hardness tester for testing steels has been designed and developed by the Central Scientific Instruments Organisation (CSIO), Chandigarh. Testing with the instrument is both fast and accurate. The instrument would be of immense use in quality control of mass-produced engineering materials.

The instrument employs a mechanical-electronic method of testing the surface hardness of machined work-pieces. A magnetostrictive rod, fixed at one end, is excited to vibrate at its natural resonance frequency. When the free end of the rod, having a diamond pyramid, is brought in pressure contact with the test sample, a semi-microscopic

indentation is formed and the resonant frequency changes. This change is related to the contact compliance and is used as a measure of hardness, read directly on a meter. Being portable and nondestructive, the ultrasonic hardness tester can be used for testing the hardness of machined parts in cramped position, as well as for continuous testing of finished components, directly in a production line. The range of the instrument is from 65 to 25 on Rockwell C scale.

The instrument has undergone successful trials in engineering industry. Its cost is expected to be one-fourth of the cost of a similar, imported instrument. The know-how of the instrument is available for commercialization. □

## Structure-Activity Relationship in Mycobacillin

The antifungal peptide mycobacillin has such undesirable properties as hemolytic activity and serum inactivation. More than 90% of the antifungal activity is lost in the presence of serum, thus rendering the antibiotic unacceptable for therapeutic and systemic application. Dr P.C. Bandyopadhyay of the Indian Institute of Experimental Medicine, Calcutta, has made attempts to develop it as an effective drug through chemical modifications.

Mycobacillin contains seven carboxyl, two phenolic and one aliphatic

hydroxyl groups in the molecule. modifications attempted by Bandyopadhyay consisted of esterification, amidation and reduction of carboxyl groups, and acetylation and methylation of hydroxyl groups. Products of different modification processes were either biologically active or inactive. Among them, acetyl derivatives were found to be most promising, since they showed undesirable properties like hemolytic activity or serum inactivation, but retained more than 50% of the original antifungal activity.

The study has thrown some light on the structure-activity relationship of the cyclic peptide. It has shown that: (i) antifungal activity appears to be exhibited by one of the tyrosine residues in conjugation with one aspartic acid and one glutamic acid residue of the molecule; (ii) the sixth tyrosine residue can be regarded as the active centre for hemolytic activity; and (iii) acetylation which completely removes the serum inactivation property indicates the active role of tyrosine residues in the reaction of the molecule with serum.

Dr Bandyopadhyay was awarded D.Sc. (1981) by the Calcutta University for his thesis based on the studies.

## Biochemistry of Submerged Fermentation of Mushrooms

Shri A.K. Ghosh of the Indian Institute of Experimental Medicine (IEM), Calcutta, has studied the biochemistry of submerged fermentation of mushrooms. Among the several different mushroom fruit bodies collected from the local field, seven were capable of producing mycelial growths and consequently these were selected for the development of morphogenized cultures. The mushrooms were successfully grown under submerged condition in shake flasks. Suitable carbon, nitrogen and micronutrient requirements for their optimum growths were determined and it was possible to have the luxuriant growth in synthetic media.



CSIO's ultrasonic hardness tester



the effect of carbon-to-nitrogen ratio on growth revealed many interesting features of the mushroom fermentation. Optimum pH and temperature for their growth were 3-5 and 29°-31°C respectively. Micronutrient compositions of the growth media not only influenced the growth but also the production of flavour and pigment during the course of fermentation. Among the different growth factors tested, caprylic and capric acids remarkably affected mushroom growth in submerged culture.

Mushrooms which usually require high carbohydrate but low nitrogen source excreted different carbohydrases in the medium where xylanase was found in common. Xylanase was purified from the culture-filtrate of the highest producer, *Termitomyces clypeatus*, to a state of homogeneity through ammonium sulphate precipitation, DEAE-Sephadex and Bio-gel P-200 chromatography. Some of the physicochemical properties of the purified enzyme were found as follows: Mr, 90,000; pH optimum, 5.5; and  $\alpha$ - or xylosidic, -mannosidic and -glucosidic activity, nil. It was strongly inhibited by  $Hg^{2+}$ . Also, it was found to be highly stable and had no cellulolytic activity.

For his thesis based on these studies, carried out under the guidance of Dr S. Sengupta of IEM, Shri Ghosh was awarded Ph.D. degree of the Calcutta University. □

## Structure and Organization of Bovidae Genomes

Miss Uma Mehra, a CSIR research fellow working at the Biochemistry Division of the National Chemical Laboratory, Pune, has made a comparative study of the DNAs of buffalo, cow, goat and sheep, all of the Bovidae family, with a view to understanding their genetic relatedness and DNA sequence divergence. The DNAs were analyzed by employing various techniques such as (i) reassociation kinetics of sonicated DNAs, (ii) thermal maturation and optical reassociation

of total DNAs and of repetitive DNA fractions, (iii) reassociation kinetics of DNAs of varying fragment lengths to understand the DNA sequence organization of repeated and single copy sequences, and (iv) inter-species DNA-DNA hybridization.

The comparative reassociation kinetics data of sonicated DNA preparations (550 nucleotide pairs) of the four Bovidae species have revealed that the repetitive DNA content varies from 26% to 40%. The proportions of rapidly reannealing (till  $cot\ 10^{-1}$ ), fast intermediate (from  $cot\ 10^{-1}$  to  $cot\ 1$ ) and slow intermediate ( $cot\ 1$  to  $cot\ 50$ ) DNA fractions varied and appeared to be species specific. Goat DNA was unique in exhibiting the absence of slow intermediate DNA fraction. The DNA melting curves in all the four species were smooth and the  $T_m$  varied in the range 83.0-85.3°C. From the  $T_m$  of repeated DNA sequences, the percentage base mismatch was found to be 8.8-10.5% in bovine, sheep and goat and 5-7% in buffalo.

The homology of repeated and nonrepetitive DNA sequences in buffalo, goat and sheep with those of bovine was investigated. The DNA-DNA hybridization studies involving nonrepetitive DNA sequences clearly indicated that buffalo was closer to bovine than sheep and goat. For example, the thermal stability of bovine nonrepetitive homoduplexes was 81.12°C, while those of bovine-buffalo, bovine-sheep and bovine-goat heteroduplexes were 79.68°C, 77.63°C, 77.48°C respectively. The fact that bovine-sheep and bovine-goat nonrepetitive heteroduplexes had a similar thermal stability indicated a probable similarity of nonrepetitive DNA sequences in goat and sheep.

The thermal stability of the repetitive heteroduplexes suggested that sheep repetitive DNA sequences were more closely related to those of bovine than those of buffalo and goat.

The rate of single copy sequence divergence in the evolutionary lines leading to Bovidae species was

calculated to be 0.09-0.12% per million years as against 0.09-0.36% per million years in primates. The nucleotide pair change per germ cell division varied between 0.15 and 0.31. In primates this value was found to be 0.08-0.04.

The DNA sequence organization was investigated in all the four Bovidae genomes. Reassociation measurements with DNAs of varying fragment lengths have revealed that 43-60% of the total genome consist of interspersed repetitive and nonrepetitive DNA sequences in all the four species. Hyperchromicity data of repetitive DNA fractions isolated from DNAs of different nucleotide lengths at  $cot\ 50$  in bovine, buffalo and sheep and  $cot\ 1$  in goat and of  $S_1$  nuclease resistant to  $cot\ 50$  and  $cot\ 1$  DNA fraction showed the average length estimates of repeated sequences in the range 956-1440 nucleotide pairs. Agarose gel electrophoresis experiments indicated the presence of a minor interspersed repetitive DNA fraction consisting of more than 4000 nucleotides in buffalo, goat and sheep and 3200 nucleotides in bovine. Approximately one-third of the nonrepetitive DNA sequences was found to be interspersed and their average length was estimated as 1100-1450 nucleotides.

Miss Mehra, who worked under the guidance of Dr R.K. Ranjekar, was awarded Ph.D. degree by the Poona University for her thesis based on the studies. □

## Deputation Briefs

Shri K.S. Rangarajan of the Publications & Information Directorate, New Delhi, was deputed to UK on a four-week study visit from 13 March 1981 to institutions engaged in science information and publication, under the British Council-CSIR Exchange Programme. Shri Rangarajan visited the Primary Communications Research Centre (PCRC) at the Leicester University, the Institute of Physics at Bristol, INSPEC at Hitchin, Blackwell Scientific Publishers and Pergamon Press at Oxford and publishing houses



of *Nature* and *New Scientist* and the Royal Society at London.

At PCRC Shri Rangarajan addressed a seminar and initiated proposals for collaboration on some of the research projects in their purview. At the Institute of Physics, he studied the *modus operandi* of their publication activity with special reference to methods adopted for quick refereeing of manuscripts, cost estimation of publications, conventions in the use of units and terminologies in physics, and typographic standards.

Shri Rangarajan got acquainted with the Mark-2 system of information storage and retrieval being introduced at INSPEC. He also obtained information on software for use with INSPEC magnetic tapes in SDI services and discussed with them the extent to which such tapes could be put to use to serve Indian scientists without infringing copyrights.

At the various publishing centres he visited, Shri Rangarajan made a study of the new techniques used in the commercial publication of technical manuscripts. At the Royal Society he compiled information on the publication of Indian scientists in the first half of this century for a future analysis of the growth of scientific research in India. □

## PROGRESS REPORTS

### CSIR Annual Report: 1979-80

The Council of Scientific & Industrial Research (CSIR) has brought out its annual report for 1979-80. According to the 68-page (A4) report, 37 new processes developed by the Council went into production, 58 processes were released to industry for the first time, 653 sponsored research schemes having a contract value of Rs 96.60 million were in operation and work on 243 schemes was completed. As many as 104 patent applications were filed, 41 patents accepted and 121 patents sealed in India; three patents were filed abroad. The total number of CSIR processes released to industry till the end of the

year was 1234 out of which 537 processes were reported to be in production. The Council had in hand 270 consultancy assignments valued at about Rs 7 million; 149 assignments were completed. The premia/royalties received through the National Research Development Corporation of India (NRDC) increased from Rs 4.20 million in 1978-79 to Rs 5.26 million in 1979-80.

CSIR's total expenditure for 1979-80 amounted to Rs 539.81 million; the plan and non-plan components being Rs 219.23 million and Rs 320.58 million respectively. The breakup of expenditure (Rs million) coordination council-wise was: physical sciences—89.86, chemical sciences—80.92, biological sciences—111.15, engineering sciences—122.09, and information sciences—16.70.

The processes developed for the public sector included those on: gun sight reflector glass and collimating sight glass for aircraft, high-altitude carbon brushes, electronic information display system, a substitute for hermetic sealing compound used for metallic joints and couplings, butenediol, and low-temperature storage of fruits.

An improved method of isolating the anti-cancer drug vinblastine from *Vinca rosea* leaves was developed. Processes relating to Monocrotophos, DDVP, quinalphos, diazinon, bromine, *l*-ephedrine, lidocaine, diapsone, etc. were released/demonstrated to interested parties.

A process was developed for briquetting of char fines using a starch-based binder to produce smokeless fuel for domestic and industrial use. Also developed were technologies for a heat-resistant alloy cast iron for high-temperature (up to 1000°C) applications, high-alumina ceramics, and transparent heat-absorbing glass.

Processes which could be taken up by small scale industries relate to the production of crystalline papain, pectin, calcium citrate, tamarind powder, sodium silicate, fibreglass, pine wool, and isatoic anhydride. A new pedal pump, whose average discharge is 6000

litres/hr at 6-ft head, was developed. This pump, which could find application in lift irrigation, is also within the competence of small-scale industry for manufacture.

The Council's laboratories continue to supply information on agrotechnologies pertaining to aromatic and medicinal plants.

Among the instruments designed and developed by CSIR laboratories mention may be made of (i) a versatile crystal puller for growing single crystals from melt, (ii) a non-fade ECG monitor based on electromagnetic deflection CRT, (iii) a digital speedometer used in diesel locomotives, (iv) a cardiograph for computing foetal heart rate, (v) an automatic blood cell counter, and (vi) an aeroscope for trapping airborne pollen and spores.

Some of the important projects undertaken primarily to aid rural development were: setting up of slow sand filtration plants, mushroom cultivation, and rural sanitation programme.

The Council collaborated with ministries/departments in several projects, notably those relating to special interference filters, black stamp cancellation ink, low-temperature carbonization plant, geological surveys, and food resources surveys.

Three processes were released to parties abroad: spice oleoresin, defluoridation and solar dryer design. A pilot plant for the manufacture of diosgenin and progesterone based on the CSIR technology was set up in Burma. □

### RRL-Jorhat Annual Report: 1979

Successful transfer of the process of manufacturing a chemical additive used for the beneficiation of iron ore, and development of know-how for the pesticide Chlorfenvinphos and of a new and improved strain—Jorlab C2—of *Java citronella*, are among the R&I highlights of the Regional Research Laboratory (RRL), Jorhat, as revealed in its annual report for 1979.



Following the transfer of know-how the production of the chemical additive for iron ore beneficiation to Allied Resins and Chemicals Ltd, Calcutta, the laboratory assisted them in commissioning the production unit. Trials were under way at Barsua iron ore washing plant of the Rourkela Steel Plant on the performance of the additive. As part of CSIR's programme of developing technologies for important pesticides, this regional laboratory developed know-how for the pesticide chlorfenvinphos (technical grade). It also concluded agreements with the National Organic Chemical Industries Ltd, Bombay, for providing process know-how and engineering consultancy for setting up at RRL a 100 kg/batch plant designed to provide data for OCIL's 600 tonnes/annum commercial plant.

The laboratory also demonstrated the production of another pesticide malathion to Shriram Pesticides & Chemicals, New Delhi, after developing the know-how in collaboration with RRL, Hyderabad. A techno-economic feasibility report for production of 300 tonnes/annum of the pesticide was provided to Nagarjuna Agro Steel Corporation, Vijayawada.

The improved Java citronella strain, strain C2, gives higher yields of herb as well as oil than the Bangalore and Jorhat strains.

With a view to ensuring effective transfer of the mini cement plant technology which it has developed, the laboratory entered into an agreement with the FACT Engineering & Design Organisation, Cochin, and the National Research Development Corporation of India to offer the technology on a turn-key basis. Towards this end a detailed design package for a 30 tonnes/day vertical shaft kiln was prepared. On the basis of this technology offered earlier, a Gujarat firm was putting up, with technical assistance from RRL scientists, a plant aimed at an ultimate capacity of 100 tonnes/day.

At the instance of NRDC the laboratory was setting up a de-

monstration unit for the production of corrugated roofing sheets (1 tonne/day) from waste paper at the Central Research Organization, Rangoon.

Other applied research projects under way were concerned with: production of a cement-like product from paddy husk ash, heat-stable amylase, self-adhesive paper, pulp from raw materials available in the north eastern region, and an additive for improving the flow of petroleum products.

An important project under way in basic research is concerned with seismic surveillance of a seismically hazardous segment of north east India. The work is being done in collaboration with the National Geophysical Research Institute, Hyderabad.

Some of the projects investigated by the laboratory were aimed at rural uplift. Following the construction of a number of experimental low-cost bamboocrete buildings in Jorhat, the laboratory has developed a standard design for construction of such houses and supplied the design to a number of parties. The laboratory made concerted efforts to popularize among villagers the cultivation of medicinal and essential oil plants as also mushrooms.

The laboratory has been identified as the lead laboratory for an inter-country collaborative R&D project on management of water hyacinth; the project is sponsored by the Commonwealth Science Council and financed by UNEP. An aquatic weed, water hyacinth poses serious environmental problems but has many potential uses—in pollution control and as a source of energy, food, fodder, fertilizers and other industrial products. In a project funded by the International Foundation for Science, Stockholm, the laboratory is screening plants of the north eastern region known to possess pesticidal properties. The project also envisages extraction of active principles, their identification and comparative evaluation with known synthetic pesticides.

Ten processes were released to industry, seven of them through NRDC. Two processes based on RRL

know-how relating to (i) carbonless paper and (ii) correction paper, direct-copy paper and thermographic paper went into commercial production. Consultancy services rendered by the laboratory netted in an income of over Rs 2.2 lakh.

The expenditure of the laboratory for the year 1979-80 amounted to Rs 106.127 lakh. □

## PATENTS FILED

426/Del/80: A method for the preparation of  $\gamma$ -lactone of IR cis, 2,2-dimethyl-3-hydroxy methyl cyclopropane carboxylic acid from methyl IR cis, 2,2-dimethyl-3-(2-oxopropyl) cyclopropane carboxylate, R.B. Mitra, G.H. Kulkarni, P.N. Khanna & G.D. Joshi—NCL, Pune.

208/Del/80: A new process for the preparation of 2,2-dimethyl-3-(2-oxopropyl) cyclopropane acetic acid, an important intermediate in the synthesis of chrysanthemic acid and synthetic pyrethroid insecticides, R.B. Mitra, V.K. Hinge & A.S. Khanra—NCL, Pune.

512/Del/80: A new route for the preparation of IR, cis-2-2-dimethyl-3-(2-oxopropyl) cyclopropanecarboxylic acid, an important intermediate for the synthesis of pyrethroid insecticides, R.B. Mitra & A.S. Khanra—NCL, Pune.

## PERSONNEL NEWS

### Honours and Awards

#### OTAI Award for CFTRI Scientists

For their paper entitled 'Effects of long-term feeding of refined sal (*Shorea robusta*) fat in albino rats' M.N. Guttikar, O.E. Sundaravalli, B.L.M. Desai, and Kantha S. Shrupalekar of the Central Food Technological Research Institute (CFTRI), Mysore, have won the Rasoi Award established by the Oil Technologists Association of India (OTAI); the paper is adjudged the best scientific contribution published in *Journal of the Oil Technologists Association of India* for the period April 1979 to March 1980 [1980, 12(1), 4].



Sal fat has received considerable attention because of its possible use as cocoa butter extender in confectionery and chocolate industry, but the effects of long-term feeding of sal fat are not known. The CFTRI scientists' study on albino rats has shown that reproduction and lactation performance of rats fed 15% sal fat diet over three generations was comparable to that of rats fed refined groundnut oil or hydrogenated vegetable oil at similar levels. Blood picture, organ weights, plasma lipid and glucose levels were comparable in rats fed 15 or 30% of sal fat, refined groundnut oil or hydrogenated vegetable oil for 9 months. No abnormal effects of feeding sal fat were observed.

A cash award of Rs 1000 along with certificates would be given to the authors jointly. □

#### IPA Award for CECRI Research Papers

Two research papers of the Central Electrochemical Research Institute (CECRI), Karaikudi, have been awarded the second prize by the Indian Paint Association (IPA), Calcutta, for 1980; each paper has been awarded a cash prize of Rs 3000 and a citation. The titles of the papers (to be published) and their authors are: (1) Electrolytic production of cuprous oxide, H.V.K. Udupa, K.C. Narasimham, R. Viswanathan, M. Nagalingam, N. Thiagarajan, R. Palanichamy, S. Pushpavanam, M. Sadagopalan, N.S. Raghavendran, and V. Rengarajan; and (2) Parameters for industrial research on electrodeposition of resins and polymers, S. Guruswamy. □

#### Obituary

Dr S.S. Chari of the National Physical Laboratory (NPL), New Delhi, expired on 2 April 1981 after a brief illness. Starting his scientific career in NPL in 1949 he rose to the position of Scientist EII by dint of hard work. Dr Chari is well known for his contributions in the fields of ultrasonics, rheology and carbon technology. Over the last two

decades he devoted his attention to the development and manufacture of carbon products like arc carbons, carbon brushes, carbon fibres, pitches, and carbon mixes. In spite of his physical handicap due to an accident in 1954 in USA, he was full of enthusiasm and courage and was always prepared to take up challenging tasks in the laboratory. He was instrumental in the founding of the Indian Carbon Society. He was a member of IUPAC. □

#### CONFERENCE ANNOUNCEMENTS

##### International Symposium on Salt & Marine Chemicals

The Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar, is organizing an in-

ternational symposium on Salt & Marine Chemicals from 4 to 6 May 1982 at its premises. The scope of symposium includes: new developments in salt production and byproduct recovery; problems of salt industry in developing countries; strategy for integrated development of salt-water and formulation of R&D program for exploitation of the sea for chemicals and energy.

The deadline for receipt of abstracts of papers is 15 July 1981.

Further details may be obtained from: Dr J.R. Sanghavi, Secretary, Steering Committee of Symposium on Salt & Marine Chemicals, Central Salt & Marine Chemicals Research Institute, Bhavnagar 364 001.

## COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

### Advertisement No. 11/81

It is proposed to appoint two Scientists F (Deputy Directors) in the National Chemical Laboratory (NCL), Pune.

#### For Post 1

**Job requirements:** This is a senior research management position and the incumbent will be required to provide high-level leadership in research and development in the Inorganic Chemistry Division of NCL with particular reference to heterogeneous and homogeneous catalysis. He would be required to assist in the planning and execution of projects, transfer of technology, and responsible for promotion of research of a high order.

**Qualifications:** The candidate should possess high academic qualifications in inorganic/physical chemistry with specialization in the field of heterogeneous and homogeneous catalysis and should have an established record of research as evidenced from his publications.

#### For Post 2

**Job requirements:** This is a senior R&D management position. The incumbent will be expected to coordinate the work of the Biochemistry Division at the laboratory in the existing projects and to initiate new lines of work. He should be able to command the confidence of research workers in his field and be an able administrator and image builder of the laboratory. He will be expected to provide assistance to the Director in the management of the laboratory and to interact with other organizations and public bodies.

**Qualifications:** High academic qualifications in biochemistry and related areas of technology, preferably a Ph.D., and a consistently good academic career. He should have about ten years postdoctoral research experience in the field of enzyme chemistry and immobilized enzymes and microbial systems and ability to guide research groups in these and related areas.

#### Salary/conditions of service:

#### For Both Posts

**Scale:** Rs 2000-125/2-2500. Initial pay will be fixed according to merits.

Persons selected will be appointed on contract for a period of six years, which would be confirmed after an initial period of two years of satisfactory service. Qualifications and experience are relaxable in the case of candidates otherwise found suitable for the post.

**Age limit:** Below 50 years, relaxable in special cases.

Scientists/technologists interested may obtain two copies of the standard pro forma for sending their *curriculum vitae* from the Chief (Administration), Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110 001. They can also obtain a brochure on the aims and objects and latest annual report of the laboratory. Completed *curriculum vitae* pro forma must be received in this office on or before 25 July 1981.

**Note:** Candidature of applicants in response to Advertisement No.11/79 for post no.1 will be considered on the basis of their original applications and therefore, they need not apply afresh.